Editor's note

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MPA Perspective Developing Design Guidance for Offshore MPAs

By Jennifer A. Brown and Lisa Wooninck

As human impacts on offshore ecosystems intensify, there is increasing interest in creating MPA networks for spatial protection of offshore resources. However, most of the scientific guidance for designing MPA networks — such as recommendations on size, number, and configuration of MPAs — has been developed for networks located nearshore, in shallow-water habitats like coral reefs and kelp forests. As managers consider network design for deeper, offshore habitats, it is important to consider whether recommendations developed for nearshore MPAs are appropriate for offshore sites.

To address this issue, the Monterey Bay National Marine Sanctuary (MBNMS) co-hosted a workshop in December 2006 of marine ecologists and fisheries biologists, in partnership with the National Marine Protected Areas Center. The workshop asked participants for preliminary guidance on designing zones in offshore habitats (deeper than 100 m) of the 13,783-km^2 MBNMS. These zones, which are theoretical thus far, would focus on enhancing habitat/biodiversity conservation and research opportunities in the multiple-use sanctuary. They could feature a range of regulations, from allowing some extractive activities to a full ban on extraction.

Although these guidelines were developed specifically for an MBNMS stakeholder group that is considering the utility of offshore MPAs, they may also be useful to stakeholders and scientists in other regions. The workshop conclusions are summarized below.

1. Habitats should be used as proxies for species, and areas with high habitat heterogeneity may indicate areas of high species diversity. According to workshop participants, the distribution and abundance of deepwater benthic habitats is relatively well-known, including large topographic features (e.g., submarine canyons) and smaller features such as sediment type, rock type, relief, and depth. Comparatively less is known about deepwater species — especially adult movements and larval dispersal patterns — although some information on general habitat-species associations is available, particularly on how species assemblages vary with substrate type and depth. Consequently, benthic habitats were recommended as proxies for the location of species assemblages. For example, if the goal of an offshore MPA is protection of species diversity, then targeting areas with high diversity of benthic habitats (i.e., "habitat mosaics") may be a good way to achieve this goal.

2. Increased species diversity may be achieved by overlaying benthic mosaics with persistent pelagic features or processes. In addition to evaluating heterogeneity of benthic habitats for site selection, called a primary habitat consideration, participants discussed a variety of oceanographic processes and features that were termed secondary habitat considerations. Some oceanographic features, for example (upwelling shadows, retention zones, and frontal waters), are associated with increased diversity and abundance because they aggregate plankton and attract pelagic animals. In some cases, these pelagic habitats are persistent because they are associated with fixed topographic features.

3. Offshore MPAs may need to be larger compared to nearshore MPAs to capture adequate, suitable habitat and species abundances. On the U.S. west coast, hard-bottom habitats tend to be more abundant nearshore, becoming sparser as depth increases. Densities of macrofauna tend to be lower in the more homogeneous soft-bottom habitats that dominate offshore ecosystems. In addition, fishes in offshore waters tend to have larger ranges of movement, possibly due to the need to forage over homogeneous soft bottom habitat.

4. Compared to the many, smaller MPAs of nearshore networks, offshore networks should contain fewer, larger MPAs (see above) that are distributed widely. This type of configuration incorporates latitudinal variation in species distribution, habitat characteristics, and oceanographic processes. Fish and bird assemblages, for example, tend to vary biogeographically according to latitude. Geology and submarine canyon type also vary north and south of the Monterey Canyon in the MBNMS.

5. Consider continuity of offshore MPAs with existing nearshore MPAs to capture age-related and seasonal migratory patterns of species. MPAs can be networked through two processes: continuity and connectivity. Networking through continuity is based on active movement of juveniles and adults from one MPA to another, while connectivity is based on dispersal of larvae. Maximum continuity for juvenile rockfish (*Sebastes* spp.), for example, could be achieved using nearshore and offshore MPAs that are contiguous (sharing a common boundary), thus providing uninterrupted protection as the fish migrate to deeper water as adults. For an offshore network of fewer, larger MPAs, effective networking via larval dispersal will likely be achieved given the following criteria: the size of the managed area is not disproportionately large relative to MPA sizes within the network; offshore species have larvae with large dispersal distances; and MPAs in the network contain representative habitats.

6. When appropriate, protect unique or rare habitats (such as seamounts and canyons with endemic species) regardless of the feasibility of networking such potentially remote areas. Not all MPAs are easily connected within a network.

For more information

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Before the Ice Melts: Experts Discuss Proactive Protection of the Arctic Ocean in Anticipation of Climate Change

Conservation of ocean resources is typically a reactive exercise. Managers respond to the degradation of ecosystems or depletion of species by taking steps to try to restore what was there before. Most MPAs are, in essence, an attempt to re-establish a more "natural" state where human activity has already had an impact.

Ecologically, the ideal conservation method would be proactive: protecting a natural state before it is significantly impacted by human activity. Opportunities for proactive management are relatively rare, however. More and more of the global ocean is the site of human activity — fishing, shipping, oil and gas drilling, etc. — even, increasingly, the deep sea. Once such activity is underway in a particular region, it becomes politically difficult for managers to place limits on it.

The Arctic Ocean presents an unusual opportunity for proactive conservation on a grand scale. With climate change, the ice-covered Arctic is melting. According to simulations of ice decline based on Intergovernmental Panel on Climate Change scenarios, the region could be free of summer ice by 2040 in the worst-case scenario of warming. This development is expected to open up lucrative opportunities for industry: virgin fishing grounds; a shorter shipping route (the Northwest Passage) between the Pacific Ocean and Europe; and major new drilling fields for petroleum. In fact, the petroleum fields — totaling as much as 25% of global undiscovered reserves, according to some estimates — are a primary driver behind Russia's recent claim of jurisdiction over much of the Arctic Ocean [see box below].

Is there an opportunity to establish a management regime across the Arctic Ocean before these activities commence? If so, what would such a regime look like? In recognition of the ongoing International Polar Year, *MPA News* asked experts this month for their views, including on the idea of designating an MPA across the entire Arctic Ocean. Their responses are below.

Voluntary moratorium on resource exploitation in the Arctic: David Hik

David Hik is professor and Canada research chair in Northern Ecology at the University of Alberta, Canada. He is also executive director of the Canadian International Polar Year Secretariat.

"A single, enormous protected area is unlikely. I expect each country will keep jurisdiction over its EEZ, but will enter into co-management agreements with other Arctic Ocean rim nations (and other nations with Arctic

National claims to the Arctic seabed

In July 2007, the voyage of a Russian icebreaker and two submersibles to plant a Russian flag on the seabed of the North Pole attracted global media attention. It was a high-profile way for Russia to assert sovereignty over much of the Arctic Ocean. What portion of the Arctic is eventually judged to be inside national jurisdictions, and what portion is judged to remain on the high seas, will play an important role in eventual management of the region.

Coastal states generally claim a 200-nm limit for their Exclusive Economic Zones, within which they hold jurisdiction over all natural resources. However, the UN Convention on the Law of the Sea (UNCLOS) allows claims beyond that if the natural prolongation of an adjoining continental shelf extends farther than 200 nm.

In 2001, Russia filed a claim with the UN that its continental shelf extended over a majority of the Arctic Ocean — encroaching on areas that Canada, the U.S., and Denmark (Greenland) anticipated claiming for themselves. The latter nations filed protests, and the UN instructed Russia to submit a revised claim with more scientific data to justify its case. Russia's July expedition was part of that revision effort.

It will be up to a UN commission (the Commission on the Limits of the Continental Shelf, or CLCS) to judge each nation's eventual claims. That adjudication process is expected to last the next decade or more, as countries still have to submit scientifically complete claims, based in part on the depth and shape of the seabed and the thickness of underlying sediments. The CLCS website is http://www.un.org/Depts/los/clcs_new/clcs_home.htm.

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